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AUG 6 1980

GA 1.13:FGMSD-80-60

BY THE COMPTROLLER GENERAL

# Report To The Chairman, Committee On Government Operations House Of Representatives OF THE UNITED STATES

COMPLETED
ORIGINAL

# VA Must Strengthen Management Of ADP Resources To Serve Veterans' Needs

Weaknesses in management and use of data processing resources at the Veterans Administration could adversely affect VA's ability to effectively serve the needs of veterans.

These weaknesses include

--inadequate capacity planning that results in "crises" shortages of computer support,

--excessive reliance on noncompetitive acquisitions,

--uncoordinated planning that results in incompatible systems, and

--failure to rank software investments according to priority and failure to effectively control the implementation of those that are approved.

Although VA is taking steps to correct these weaknesses, GAO recommends that the Congress withhold further funding for the Health Care Information System until satisfied they have been corrected.

FGMSD-80-60

JULY 16, 1980

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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-199276

The Honorable Jack Brooks
Chairman, Committee on
Government Operations
House of Representatives

Dear Mr. Chairman:

This report is our response to your October 6, 1978, request for information on the Veterans Administration's management and use of its automated data processing resources.

As you requested we did not obtain written agency comments, but we discussed our findings with VA officials and have considered their comments in arriving at our conclusions.

As arranged with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 15 days from its date. At that time, we will send copies to interested parties and make copies available to others upon request.

Sincerely yours,

Comptroller General
of the United States

A

COMPTROLLER GENERAL'S
REPORT TO THE COMMITTEE ON
GOVERNMENT OPERATIONS
HOUSE OF REPRESENTATIVES

# VA MUST STRENGTHEN MANAGEMENT OF ADP RESOURCES TO SERVE VETERANS' NEEDS

## D I G E S T

The Veterans Administration needs to make better use of its automatic data processing resources if it is to effectively support veterans' needs. A master ADP plan, guided more by overall ADP needs than by parochial wants, must be developed and followed.

VA uses ADP extensively in providing the Nation's 35 million veterans and 63 million family members and survivors of veterans with pension, health care, education, insurance, housing, and compensation benefits. Although the estimated $113 million it spends annually for data processing is only a small part of its annual budget of about $20 billion, data processing significantly affects virtually all of its operations.

Serious weaknesses in VA's management of its ADP resources can adversely affect the acquisition, development, and maintenance of its ADP systems. These weaknesses include:

--Computer acquisition practices that do not meet user needs or comply with Federal policies. (See pp. 5-7.)

--Software work approval practices that do not assure that resources spent on software are channeled to the most important projects. (See pp. 15-16.)

--Ineffective control of software work in process. (See pp. 23-26.)

--Poorly coordinated use of data processing by VA hospitals. (See pp. 27-31.)

--A need for more systematic and responsible involvement of hospitals in planning for a



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critical Health Care Information System estimated in 1978 to cost $520 million. (See pp. 33-37.)

## WEAKNESSES IN ACQUIRING COMPUTERS

The Veterans Administration has not done an effective job in acquiring computers and related equipment. It has been slow in identifying and responding to user needs, and its efforts to obtain new and additional equipment typically have been marked by crises, sole-source acquisitions. The agency has also had difficulty determining its computer capacity needs, leading to the purchase of computers that were either too large or too small. Moreover, it has overlooked the emerging interdependence among systems and the related need to have compatible equipment. These weaknesses have caused capacity problems, have increased operating costs, and have downgraded user support.

## WEAKNESSES IN SELECTING AND MANAGING SOFTWARE WORK

Because of weaknesses in planning and approving software work and in assigning staff, VA cannot be sure that the resources it spends on software are being channeled to projects of the greatest benefit to the agency. Except for one or two high priority projects, software work is approved by users on a day-to-day, project-by-project basis with little or no regard for overall agency or departmental needs or for whether the work is required or discretionary. A primary concern is providing work for the staff assigned to maintain specific systems. Further, work is often approved at inappropriate management levels without accurate and meaningful project definitions, cost estimates, and benefit analyses.

## INEFFECTIVE CONTROL OF SOFTWARE WORK IN PROCESS

Once projects are approved, VA does not have a well-defined approach for managing

its work. Instead, it follows an unstructured, often hurried approach and specifications are frequently faulty. VA does not have a useful system for monitoring progress and costs of work in process. Consequently, development projects have been plagued by cost overruns, schedule slippages, and performance deterioration.

## WEAKNESSES IN MANAGING HOSPITALS' USE OF COMPUTERS

VA hospitals are allowed considerable latitude in determining which medical functions to automate. This situation has led to procurement and in-house development of different computer systems to automate similar medical functions. Opportunities for sharing these systems with other hospitals are not systematically pursued. Possible savings from using standardized systems and consolidated purchasing are foregone, and potential patient care improvements and reduced operating costs are not realized when hospitals do not use the most successful systems.

## RESEARCH NEEDED BEFORE DESIGNING PROPOSED HEALTH CARE SYSTEM

The Administrator of Veterans Affairs has approved a mission need statement for a Health Care Information System estimated in 1978 to cost $520 million. While hospitals definitely need more computer support, VA needs to do considerable research before beginning to design the system. Most, if not all, of the 13 functions proposed for automation may have already been automated by one or more of VA's hospitals or by other hospitals. VA should determine whether any of these established systems will satisfactorily meet its needs. Use of existing systems could speed up installation and save millions of dollars.

The hospital system must also interface with some of VA's other major systems. The extent and nature of such interface should be determined in advance so that proper allowances may be made in the design of the new system.

Also, VA hospitals need to be involved in both the determination of and the accountability for specific requirements. GAO's experience has proven many times that when users do not participate in a responsible manner, systems are destined for failure.

RECOMMENDATIONS

GAO recommends that the Administrator of Veterans Affairs:

--Make a firm commitment to competitive procurement, and establish management procedures as well as a formal planning process that will further the prompt competitive acquisition of the correct type and size of ADP equipment.

--Strengthen the planning process by requiring wider user participation, a distinction between required and discretionary software work, and more accountability at the senior management level.

--Establish a staff dedicated to performing discretionary software work such as development, redesign, enhancement, and conversion.

--Adopt and act to enforce the management techniques and procedures being proposed for controlling software work.

--Establish better coordination of hospitals' use of ADP resources.

--With the aid of users, analyze more thoroughly the health care system being planned. This analysis should include a detailed study of available capabilities in-house, in other Federal agencies, and in the private sector.

GAO also recommends that the Congress withhold further funding for the Health Care Information System until the Appropriations Committees are satisfied that VA will implement the substance of the recommendations contained in this report.

## AGENCY COMMENTS

As requested by the House Committee on Government Operations, GAO did not obtain written agency comments. The matters covered in the report, however, were discussed with VA officials who provided GAO with additional information and/or advised GAO of actions taken on a number of the points discussed in the report. VA's comments are discussed on pages 38 and 39.

Tear Sheet

## ABBREVIATIONS

| | |
|---|---|
| ADP | automatic data processing |
| BIRLS | Beneficiary Identification and Records Locator System |
| GAO | General Accounting Office |
| HCIS | Health Care Information System |
| TRIMIS | Tri-Medical Service Information System |
| VA | Veterans Administration |

# CHAPTER 1

## INTRODUCTION

The Veterans Administration (VA) was created by act of Congress in 1930 and charged with providing pension, health care, education, insurance, housing, and compensation benefits to qualified veterans of the armed forces. VA now serves about 35 million veterans and 63 million family members and survivors of veterans. In fiscal 1980, VA will spend about $7 billion to administer its various programs and another $13 billion in direct payments to qualified veterans. To accomplish its mission, VA employs over 213,000 workers in 172 medical centers, 58 regional offices, and various other facilities in the United States, Puerto Rico, and the Philippines.

VA uses computers extensively to aid in administering its various programs. From such agencywide applications as payroll and logistics to such small, localized programs as individual pharmacy information, computer operations have an impact on virtually every aspect of VA activities. VA, under the direction of its office of data management and telecommunications, operates six automated data processing (ADP) centers in Washington, D.C.; Philadelphia, Pennsylvania; Austin, Texas; Chicago, Illinois; St. Paul, Minnesota; and Los Angeles, California. About 1,650 of the office of data management's total staff of about 2,000 are located at these six centers.

In addition to this ADP capability, VA has at least 400 minicomputers located at the 172 VA medical centers in the United States, Puerto Rico, and the Philippines. VA estimated that it spent $113 million in 1979 for ADP system support and expects to spend substantially more in the near future.

## MAJOR CURRENT AND PLANNED INITIATIVES

VA has three major system development efforts underway. Two deal with its compensation, pension, and education applications--one project (called Target), is to redesign the applications and the other is to make legislative changes to the applications. The third effort is development of a Health Care Information System (HCIS). VA is also converting some application software from computer-dependent language to standard COBOL.

Target is a multiyear, $148.6 million project to redesign the automated compensation, pension, and education applications. It is intended to modernize VA's benefit claims processing system and improve services to veterans. Benefits

expected include much faster development of claims, earlier delivery of initial benefit checks to veterans, quicker responses to veterans' inquiries, and major savings from workload reductions in the regional offices as a result of more efficient procedures and workflow. New computer equipment has been acquired to support this project and additional equipment may be requested.

We issued a comprehensive report on the Target system on July 20, 1977--"Veterans Administration Justification of Costs and Benefits of Proposed Computer System (Target)," (HRD-77-98, July 20, 1977). Except for several specific areas, in this review we did not examine the detailed management and performance of the Target effort. A separate group of our auditors has been monitoring this project closely and reporting relevant status information to the appropriate congressional committees.

The second major effort is to make legislative changes to the compensation, pension, and education applications. As of January 1980, work on the compensation application was nearly complete.

The Health Care Information System was estimated in 1978 to cost about $520 million. As the main focus of ADP development in the department of medicine and surgery from fiscal 1980 through 1985, the system is intended to emphasize patient care and patient support systems while providing for management information needs. The system's purpose is to provide relief from the high volume of routine information-handling tasks that are now performed manually by physicians, technicians, and administrative personnel. New equipment will be required to support this system.

## ADP MANAGEMENT STRUCTURE

Management and control of data processing within VA is divided among the major users (departments and staff offices) and the office of data management and telecommunications. This office budgets and funds most data processing costs, including programmer and analyst salaries, computer center expenses, equipment costs, and contract work. It is also responsible for acquiring computer equipment (except for the small computers that hospitals can buy on their own), operating the centers, and providing personnel to do software work.

The users are responsible for maintaining their software applications and for initiating proposals to develop new applications and revise existing applications. Except for

development work on Target, users have substantial control over the programmers and analysts who do software work.

The department of medicine and surgery is the largest of VA's functional divisions with about 180,000 employees, or about 85 percent of the total VA staff. In providing health services to veterans, the department uses and manages extensive data processing resources in such specialized areas as automated prescription systems, cardiovascular monitoring, control of laboratory tests, and such administrative support as hospital bed census reports.

The department of veterans benefits provides compensation, pension, and educational benefits to veterans and their beneficiaries through major field stations throughout the country. Benefits provided by this department account for approximately 66 percent of VA's total budget. Several large computer-based applications are used to support veterans' benefit programs such as insurance, housing, compensation, pension, and education.

The office of comptroller manages the administrative applications which serve the functional divisions of the agency. These applications, which include payroll, personnel, and management reporting, are all highly centralized.

The department of memorial affairs, a fairly recent addition to VA, has virtually no data processing support other than administrative applications managed by the Comptroller. Plans provide for support to this division in the future.

## SCOPE OF REVIEW

On October 6, 1978, the Chairman of the House Committee on Government Operations requested that we review VA's overall ADP management and use of ADP resources, especially its plans to noncompetitively upgrade its Austin, Texas, data processing center. On May 23, 1979, we issued a preliminary report (FGMSD-79-27) to the Chairman concerning those plans and in this report we are responding to the overall management issues raised in the request.

We reviewed VA's procedures for planning, approving, and acquiring computer equipment and related development activities, and for controlling systems development efforts. We compared VA's ADP management practices with Government-wide guidance for managing, acquiring, and using computer systems. We discussed the development of management information systems and the procurement of computer equipment with officials of the Office of Management and Budget and of the following VA organizations:

--Office of the Administrator.

--Department of Veterans Benefits.

--Department of Medicine and Surgery.

--Office of Data Management and Telecommunications.

--Office of the Comptroller.

--Department of Memorial Affairs.

--Data processing centers in Austin, Texas; Hines (Chicago), Illinois; St. Paul, Minnesota; and Philadelphia, Pennsylvania.

--Hospitals in Dallas, San Antonio, and Houston, Texas; New Orleans, Louisiana; Hines and West Side, Chicago, Illinois; Miami, Florida; and St. Paul, Minnesota.

--Regional offices in Waco, Texas; New Orleans, Louisiana; Philadelphia, Pennsylvania; and Chicago, Illinois.

## CHAPTER 2

## COMPUTER ACQUISITION PRACTICES NOT MEETING USER NEEDS, FEDERAL POLICIES

The Veterans Administration has not done an effective job in acquiring computers and related equipment. It has been slow in responding to user needs and its efforts to update and acquire additional equipment have typically been marked by crises, sole-source acquisitions. VA has had problems determining the computer capacity needed to satisfy user requirements and consequently has purchased computers that were either too large or too small. Its acquisition practices overlook the emerging interdependence among systems and the related need for compatible equipment. The Administrator should make a firm commitment to competitive procurement and establish better procedures for determining computer capacity requirements and for acquiring computers and related equipment.

### MANAGEMENT MUST OBTAIN THE TYPE AND SIZE COMPUTERS NEEDED AND FOLLOW COMPETITIVE PROCUREMENT POLICIES

Management has a number of responsibilities in acquiring computers. Primarily, it must satisfy user requirements and do so in a timely and cost effective manner. In a large organization with many computers, backup, load balancing, and sharing are essential, and management must assure that its computers are compatible when necessary. Management is also responsible for following Federal policies requiring competitive procurement.

Public Law 89-306, commonly referred to as the "Brooks Act," provides the cornerstone for ADP policy within the Federal Government. This law provides for the economic and efficient purchase, lease, maintenance, operation, and utilization of automatic data processing equipment by Federal departments and agencies. Since the Brooks Act was passed, many policies, procedures, and regulations have been established to direct and guide Federal agencies in their management of these resources. One of these is OMB Circular No. A-71 which states that the heads of all executive departments and establishments are responsible for administering and managing their automatic data processing activities, including agencywide planning, coordination, and control of equipment software and personnel.

Another is Federal Property Management Regulation 101-35 (formerly contained in Federal Management Circular 74-5) which, among other things, establishes policies for documenting the need to acquire ADP equipment and for competitive acquisitions.

## VA HAS NOT BEEN EFFECTIVELY MEETING THESE REQUIREMENTS

VA has not done an effective job of acquiring data processing equipment. It has been slow in responding to user needs. Moreover, its efforts to obtain new and additional equipment have been typified by crises, sole-source acquisitions. Also, VA has acquired equipment that was either too large or too small as well as incompatible when compatibility was called for.

## COMPUTER CENTERS OVERLOADED; NO ORDERLY PLAN FOR EQUIPMENT ACQUISITION

According to its records, VA has experienced capacity problems at its data processing centers. Its fiscal 1979 5-year ADP plan reports all six of its data processing centers at or near capacity. Adding to this capacity shortage the plan proposes adding 32 new and redesigned applications to the inventory of over 340 applications. These include an agencywide management information system, several data base management systems, and a Health Care Information System.

This 5-year plan, though, cannot be fully relied on. We know from our review that the Hines and Austin Centers are overloaded. We also know that the Philadelphia Center is operating with obsolete computers. Despite the deficiencies in equipment capacity stated and implied by VA's 5-year plan, the plan does not lay out, except in the broadest terms, a course of action for acquiring additional equipment at the six centers. Also, as far as we could determine, VA has no well thought out program for replacing computers that become obsolete and inefficient. Computers are apparently replaced when a larger system can be justified to meet added user requirements.

## NONCOMPETITIVE ACQUISITION USED IN RESPONSE TO CRISES NEEDS

By resorting to noncompetitive procurement, the Veterans Administration has effectively sidestepped the lack of an organized plan for acquiring equipment. Since 1975, with the exception of the Target acquisition, VA's large-scale computer needs have been met with sole-source acquisitions.

VA maintains that these crises acquisitions were needed to support essential requirements.

Examples of noncompetitive acquisitions

In 1976, citing a critical capacity shortfall at the Hines data processing center, VA acquired an IBM 370/168 under sole-source procurement to support its compensation, pension, and education applications. An IBM 370/145 was acquired noncompetitively to support crises needs at the Philadelphia data processing center.

In 1979 VA proposed a sole-source upgrade for its Austin data processing center. Describing Austin's inability to support user requirements as critical, VA requested an IBM 370/168 multiprocessor to meet this center's computational requirements. In a prior report we had challenged the need for that large an increase in computational capacity. However, due to what appears to be a dramatic increase in workload, a crisis has developed at Austin that would require another sole-source acquisition to resolve. Even though Federal Property Management Regulations (sec. 101-35) require that a noncompetitively acquired system be replaced by a competitively acquired system within 24 months, VA, citing the crises in capacity at Austin, recently requested and obtained approval to transfer the IBM 370/168 mentioned above to the Austin center.

Such acquisitions are contrary to Government policy and good management practices. They can be avoided through adequate planning.

Three reasons for reliance on noncompetitive acquisitions

VA's reliance on sole-source rather than competitive acquisitions seems to be based on three interrelated reasons. First, as we noted previously, VA does not have a systematic process for acquiring equipment. Secondly, management is able to avoid the lengthy and difficult task of soliciting competitive bids. And lastly, management can avoid the cost and effort of software conversion which might be necessary if the company winning the bid competition has computers different from the one the VA installation is using.

VA has a number of applications that are written in assembler language unique to the computer on which the applications are processed. For example, more than 80 percent of the Beneficiary Identification and Records Locator System (BIRLS) application modules are written in machine-dependent assembler language for IBM equipment. These applications

would have to be reconstructed before they could be used on a different computer.

## COMPUTERS WITH TOO MUCH OR TOO LITTLE CAPACITY ACQUIRED

In addition to crises acquisitions, VA has acquired computers that were either too large or too small. This has resulted, at least in part, because of problems encountered in measuring computer needs. Of course, crises situations can also be created by improperly estimating capacity requirements. In acquisitions we reviewed, VA inaccurately estimated the computer capacity that was either needed to process user requirements or existing at its data processing centers. Sometimes it inaccurately estimated both. The following examples illustrate the problems experienced.

### Wrong size computers purchased for Hines

VA's inability to adequately define its computer capacity needs has resulted in capacity problems with the last two computers acquired for the Hines data processing center. The 370/168 acquired in 1976 had far more capacity than was required to process available work; its average use was about 50 percent. Conversely, the replacement computer competitively acquired in 1977 to handle the added workload for the Target system was not the right type and may not be adequate to meet all imposed requirements.

In the mid-1970s, VA began action to acquire a computer system on which to redesign and operate the Compensation, Pension, and Education system. The redesigned system, designated Target, was to be installed around 1982 and would replace the outmoded, IBM-based batch system. A request for proposal was written based on this plan. After the request for proposal was issued in January 1976, the plan was changed.

VA decided that the new equipment would first be used to convert the batch Compensation, Pension, and Education system and only then would the Target redesign proceed. Since the conversion would be an additional use for the new computer and require a different configuration of memory and peripheral equipment, VA should have determined the capacity that would be needed to handle both the batch system and Target, and then amended the request for proposal. No such determination was made, however, and Honeywell was awarded the contract--with its original specifications--in October 1977.

The IBM-to-Honeywell conversion is proceeding and using massive amounts of the Honeywell's capacity. While VA states that the batch system will, with modifications, operate

successfully on the new computer, it now realizes that the capacity remaining at the end of the batch conversion may be inadequate to support the Target effort for which the Honeywell was purchased. A solution to the probable capacity shortfall has not been found; however, VA officials informed us that the Honeywell contract does provide for capacity augmentation. 1/

Inaccurate capacity determined for Austin

In developing the proposal for Target, VA also failed to accurately determine the workload requirements the system would place on the Austin data processing center and the capacity of the computers at Austin. Veterans' master records are kept on the Austin center computers and Target must directly access these records.

As early as 1975, VA recognized that Austin's aging ADP equipment, comprising three IBM 360/65s, would need upgrading to handle the projected workload for that center. However, it continued to add programs and expand applications already being processed there. In 1978 VA officials stated that the system was operating at or near saturation levels, and according to their analysis, by late 1979 the prime shift workload would be equivalent to about 160 percent of the present system's theoretical capacity. Based on these projections, VA proposed the noncompetitive acquisition of an IBM 370/168 multiprocessor.

Our analysis of this proposal showed that VA had underestimated the current system's capacity and had not proposed actions to minimize the computer resource requirements. Proper analysis of Austin's needs could have revealed a less costly alternative. VA agreed, in general, with our analysis and recommendation that the computer center capacity at Austin be supplemented with a computer in the range of an IBM 370/158. These matters were reported to the Chairman of the House Committee on Government Operations in a May 23, 1979, letter (FGMSD-79-27).

Nine months later a VA study projected an increase of over 50 percent in the daily peak transaction workload for BIRLS at the Austin center and, according to the study the IBM 370/158 would not, as a result, provide enough capacity during the peak hours of use.

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1/We understand that in September 1979, VA did order additional equipment from Honeywell to resolve this problem.

At the request of the Chairman, House Committee on Veterans' Affairs we reviewed the VA study and found that the workload had increased dramatically. However, we also found that VA was having difficulty developing a reliable workload forecasting process. Also, its latest forecast did not reflect efforts to reduce the workload by making some procedural changes we had suggested and had not studied the possibility of flattening the peak workload by controlling the use of Target/BIRLS during peak periods. As a result of these findings, we reported to the Chairman, House Committee on Veterans' Affairs on May 7, 1980, (FGMSD-80-44) that in the time allotted for the review, we could not estimate with confidence what the computer capacity should be for BIRLS.

Proper analysis of the work to be done and the resources available to do it, studies of the feasibility of shifting parts of the workload away from the peak hours, and making changes which could reduce the transaction volume on the BIRLS are badly needed.

## INCOMPATIBLE EQUIPMENT ACQUIRED WHERE COMPATIBILITY WAS NEEDED

In a July 13, 1979, study, VA described some of its current serious incompatibility problems. For example, the Target/Honeywell teleprocessing system at Hines, Illinois, operates at a data transmission speed of 9.6 kilobytes per second using the ASCII (American Standard Code For Information Interchange) transmission code. On the other hand, the IBM-based BIRLS at Austin, Texas, upon which the Target system depends, operates at a speed of 19.2 kilobytes per second using EBCDIC (Extended Binary Coded Decimal Information Code) and a different protocol. Because of these drastic differences in technical design, VA has had to install an array of microprocessors which accomplishes the necessary interface. However, the VA study reports that this method has resulted in a very complex and extremely fragile system which has caused numerous problems in the past.

Besides being better suited to support interdependent applications, compatible equipment has other advantages. It makes training easier, allows bulk equipment acquisition, provides flexibility in assigning computer operators and programmers, and permits easier workload balancing and backup among centers.

Despite the emerging interdependence of the VA applications, the opportunity for compatibility of systems, where needed, at all VA centers may be lost. Until 1977 the agency had acquired IBM equipment (albeit noncompetitively) for all

six of its data processing centers. In 1977 it competitively acquired Honeywell equipment for the Target system. This was a stand-alone acquisition rather than a part of a master plan to upgrade its ADP capability, and the fact that Target had to directly access veterans records kept on an IBM system in Austin was not recognized. Although a degree of compatibility is being achieved at considerable cost, pressure is created to have compatible Honeywell equipment at Austin.

Interdependence of user requirements should be considered before acquiring equipment

We do not mean to suggest that VA must have the same make computers at all its centers. What we are saying is that there are sound economic and management reasons for minimizing incompatibilities and they should be considered when planning the acquisition of equipment. This underscores the need for a planning process which systematically identifies ADP requirements and their interdependencies and produces a plan to acquire the right equipment to meet these requirements with a minimum of incompatibility. While the Target system was a step in the right direction in this regard, it did not go far enough. Failure to include the BIRLS function as a part of the Target equipment design was a serious omission.

We believe that VA is still underestimating the importance of the interdependencies among the user requirements when it comes to planning and designing computer systems. For example, VA is now experimenting by placing Target terminals in a few hospitals to provide them with access to the BIRLS data to assist in more quickly determining the eligibility of veterans for medical care. This is a good test and it should be helpful in assessing the value of this method to those hospitals.

However, in a July 13, 1979, study VA reported that the additional information the department of medicine and surgery and the other departments requested be included in BIRLS will require redesign of BIRLS and could transform BIRLS into a central records locator system for VA. Honeywell has submitted a $6.1 million proposal to accomplish that redesign.

Before such a redesign is approved and the central records locator concept implemented, we believe that the functional interdependencies BIRLS now has and those it can be expected to have with such projects as the proposed Hospital Care Information System, the Loan Guaranty programs, and others should be analyzed and evaluated. In the absence of a formal planning process which assures such analysis and

systematic examination of the interdependencies among the data processing requirements of other VA departments, we believe that incompatibility problems between Target and BIRLS, such as the current interface described above, will be repeated in the next few years.

In a well-managed ADP operation, user requirements identified and integrated as warranted during the planning process, are translated into the computer capacity required to support them. This information, combined with an assessment of an organization's existing ADP capacity, provides the basis for a plan to acquire the size and type of equipment that is needed. This process is typically referred to in ADP terminology as "capacity planning."

Policies should require comprehensive capacity planning

The Veterans Administration's ADP policies do not provide for preparation of a capacity plan. Instead, each major user is to provide a 5-year forecast of its data processing needs. The agency also makes its office of data management and telecommunications responsible for acquiring ADP equipment. These provisions are good, but they are not enough.

VA's planning policy, which requires users to forecast their ADP needs, provides a good basis for anticipating ADP equipment requirements. However, there is no systematic procedure for identifying capacity requirements and evaluation of those requirements across all six of VA's data processing centers. Also, the impact on capacity requirements of interdependent functions and integration of functions is not being addressed adequately. VA should require formulation of a plan for acquiring equipment based on:

--Details about the computer capacity required to meet validated user needs.

--Comparable details about the available capacity of the computers and related equipment at each center.

--A match at the same level of detail between capacity needed and available, which would show capacity overage or shortfall.

--The need for interaction among applications.

--Replacement of existing equipment that may be worn out, obsolete, or inefficient.

## Procedures needed to estimate capacity requirements and plan for competitive acquisitions

In accordance with VA policy, the office of data management and telecommunications has been purchasing ADP equipment for VA's six data processing centers and some hospitals. (Hospitals may purchase small computers themselves; see ch. 4. 1/) However, this office has not established procedures for acquiring equipment competitively. Neither has it established criteria or systematic procedures for (1) translating user requirements into corresponding computer capacity, (2) measuring the capacity of its equipment, and (3) evaluating the condition of its computers and replacing those that are worn out, obsolete, or inefficient. Without such procedures capacity is estimated haphazardly--sometimes with good results and sometimes not--and little or no consistent attention is given to equipment condition.

## CONCLUSIONS

We believe that VA's problems in measuring the capacity of its computers and translating user requirements into corresponding computer capacity can be corrected if management establishes and requires proper procedures. VA is aware of the importance of considering the interdependencies among user requirements and will no doubt consider that in future acquisitions. However, the use of competitive rather than sole-source procurement will require a firm commitment to formal planning by the Administrator and top VA officials. The creation of crisis situations and subsequent reliance on noncompetitive acquisition will not be readily given up without top management direction.

## RECOMMENDATIONS

We recommend that the Administrator of Veterans Affairs make a firm commitment to competitive procurement and amend his planning policy to require information needed to make well thought out acquisitions. We recommend that the Administrator direct the office of data management and telecommunications to:

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1/We were told, however, that since the time of our review, actions have been initiated to control more effectively the purchase of computers by the hospitals.

--Establish a formal capacity planning process that will, among other things, consider the interdependencies among users, the compatibility of equipment, the procedures for translating user requirements into corresponding computer capacity, and the capacity and condition of existing equipment.

--Prepare a plan for competitively acquiring equipment in time to meet anticipated needs.

## CHAPTER 3

## PROCESS FOR SELECTING SOFTWARE PROJECTS DOES NOT ASSURE THAT MOST IMPORTANT WORK IS DONE

Because of weaknesses in planning and approving software work and assigning staff, VA cannot be sure that the resources it spends on software are being channeled to projects of the greatest importance and benefit to its mission.

VA establishes one or two major software development and conversion projects as priorities. However, the bulk of its software work is approved by users on a day-to-day, project-by-project basis with little or no regard for agencywide or departmentwide needs. Further, work is often approved at inappropriate management levels without accurate and meaningful project definitions, cost estimates, and benefit analyses. Additionally, staff are ineffectively assigned.

The Administrator should enforce his policies for assessing, analyzing, and approving software work. He also needs a pool of staff dedicated to performing optional work such as development, redesign, enhancement, and conversion.

### PROPER RANKING AND APPROVAL NECESSARY TO SEE THAT MOST IMPORTANT PROJECTS ARE SELECTED

Organizations typically have more work than they can do with the staff and resources they are given. Therefore, management must assess its work requirements, establish priorities, and assign staff to make sure that necessary and important work is done first. Software work that must be done to sustain operations must be distinguished from work that can be done at management's discretion.

Maintenance is usually required to correct software faults and make changes necessitated by legislation. Management generally has little choice but to provide the necessary staff and resources to do such work without regard for cost and benefits. On the other hand, development work such as enhancement and conversion and design of new systems is usually considered discretionary. Management can choose whether and when to do this work. For this work, management should assess the relative importance and cost benefits of competing proposals, set priorities, and channel available staff and resources to the projects with the highest priority.

## RESOURCES MAY NOT BE CHANNELED TO MOST IMPORTANT SOFTWARE PROJECTS

The Administrator has established policies intended to enable management to evaluate and approve software work according to its importance to the agency. As prescribed by these policies, VA prepares a 5-year ADP plan. Among other things, the plan identifies software systems on which work is planned for the coming year. This plan is intended to guide VA's ADP review group in establishing priorities. However, the ADP review group has met only once since 1977 and has established no priorities. What's more, the plan could not readily be used to set priorities and assign staff because it does not contain sufficient detail. It does not, for example, distinguish between required and discretionary work.

Instead of relying on this planning process, software work is, for the most part, selected as part of the day-to-day process of approving individual projects. Consistent with this method of selecting software projects, staff are preassigned to maintain specific systems subject to some reassignment to match shifting workload needs. As discussed below, this process of selecting software work and assigning staff has not worked well. They are kept busy working on the systems to which they are assigned. Consequently, there is little assurance that the resources VA spends on software are being channeled to projects of greatest importance to the agency.

We observed that work on some seemingly important applications is not done or is delayed, thus requiring staff to work considerable overtime, while work on other applications appears to be initiated simply to provide work for staff dedicated to "maintaining" specific systems. Expensive enhancements are undertaken when the facts strongly support complete system redesign, and much optional enhancement work is being done as required maintenance. Also, work that had been approved and started had to be aborted because of inadequate equipment capability.

## APPROVAL POLICIES NOT FOLLOWED

VA policies require management control over software projects. The major policy addressing approval of software work states that:

> "A prime prerequisite for an effective management program is a mechanism to review and evaluate requests for the expenditure of resources. In order for the evaluation process to enable management to arrive at a rational decision to approve or deny"

"such requests, the initiator of the request must provide basic information necessary to estimate the resources to be expended, the necessity for such expenditure and the methodology of work to be performed.

"Effective practices usually dictate that the management level responsible for the review, evaluation, and monitoring of a project be commensurate with the quantity of projected resources to be expended to complete that project."

Approval thresholds, commensurate with the amount of resources to be expended, and the approving official are:

--$10,000 or less, by the appropriate service director or data processing center director.

--$10,000 to 150,000, by the appropriate service director.

--$150,000 to $350,000, by the appropriate head of a department, staff office, or designee.

--Over $350,000, by the Administrator or his designee.

For major projects the initiator is required to follow the proper project protocol and estimate the resources to be expended, the necessity and benefit of such expenditure, and the methodology to be used. Initiatives for new applications, as well as revisions to existing applications, originate with the user departments or major offices. Unfortunately, users have not been seeing that approval protocol is followed. In practice the approval policies are both circumvented and ignored.

Policies circumvented

The Administrator's thresholds for project approval are being circumvented by VA's practice of dividing enhancement projects into numerous subtasks and individually approving each subtask rather than approving the project as a whole.

For example, a project to alter the rent computation routines of the Medical Planning Facilities application was divided into over 100 subtasks. Mid-level managers separately approved each subtask. No total cost estimates for the effort were prepared. Further, the identifiers assigned to each subtask were such that they could not be linked to the parent effort, which was to modify the rent computation application. Consequently, we were unable to establish a cost for this

project. According to personnel we interviewed, unrelated identifiers are routinely assigned to related subtasks.

A similar approach was used for the redesign of the Centralized Accounts Receivable System. Work was approved in fragments and no cost estimates were prepared. We did not learn how much was spent on this project. But, as with the rent computation project, it was a major effort.

Policy is ignored

The Administrator's policies for project approval have also been ignored. Projects that should have been approved by the Administrator are approved by major users (who are responsible for maintaining the systems). Also, expensive enhancement projects have been approved informally without a clear definition of the work to be performed, why the work was needed, and what it would cost. This situation is illustrated by the following examples.

The redesign of FEE BASIS, a medical system for reimbursing doctors for services provided to eligible veterans, was estimated to cost about $667,000. VA officials were unable to provide any formal approval documentation or related cost/benefit studies for this project. However, they said the project was approved by the former director of the computer assisted systems service of the department of medicine and surgery. VA policy clearly requires that projects of this magnitude be approved by the Administrator.

Similarly, VA could provide no approval documentation, cost estimates, or cost/benefit studies regarding the redesign of another system--the Guaranteed and Insured Loans application. This project was initiated by and apparently received the tacit approval of the operations management staff. The redesign was contracted out for $127,000. However, because the work to be done was not clearly defined, the effort failed. At the end of the contract period the project was incomplete; the part that had been completed was not acceptable, and the contractor was requesting an increase of approximately 170 percent of the original award fee to complete the redesign. Acknowledging that it had failed to recognize the complexity of the task, VA assumed control of the project. VA staff finally completed the project 1 year late and at a cost of over $700,000. Had this effort been properly analyzed and the cost accurately estimated, the Administrator's approval would have been required. Such approval may not have been granted without modifications which might have led to a successful first effort and much lower overall cost.

Another example was the construction of a new application estimated to cost about $331,000 and approved at the appropriate level. However, after the work was done the system could not perform as intended. The follow-on work required to complete the system cost about $249,000 more. Although the entire system cost almost $580,000, it was never submitted for the Administrator's review and approval as required. According to one official, the project approval procedure was too time-consuming and resulted in unnecessary delays.

VA's continuous enhancement of the Automated Management Information System is another case where approval authority was not adhered to. At the Austin data processing center, 27 people are assigned more or less continuously to do the enhancement work. At a nominal salary of $25,000, this amounts to $675,000 annually. Further, the enhancements have been approved without assessing the continued value of the system or its operating efficiency, which is inordinately expensive.

The current redesign of this 12-year-old system--the third major redesign since 1973--was approved by the major user in 1977 as a $349,676 effort, only $324 below the threshold requiring the Administrator's approval. The original thrust of this redesign was to allow on-line entry of source data. However, after beginning the project, the developers realized that the supporting Austin data processing center lacked adequate communications facilities to handle the on-line requirement, and this objective was abandoned. Nonetheless, other work was done and, according to our analysis, the cost had grown to about $757,000.

Some VA officials consider this system to be critical to management control of nationwide VA operations. We did not attempt to assess the system's value but we are convinced that the time has come to reevaluate the cost and benefits of it before any more enhancements are approved. The cost of entering source data and of operating this patched up system are high. Our inquiries disclosed that:

--Hospitals and regional offices must gather and submit thousands of data elements annually.

--Hospital and regional office staffs complain of the clumsy and time-consuming input formats and admit that they have manipulated input data to influence central office actions.

--One hospital estimates that 5-1/4 staff-years are required to gather and submit data annually; one regional

office estimates 1-1/2 staff-years annually. Although not statistically valid VA-wide, this extrapolates to about 1,000 staff-years annually.

--Many hospital and regional office personnel consider the output to be useless--often an exact reprint of the data they input.

Although these facts cast doubt about the cost/benefit value of this system, the enhancements are made without analyzing either performance efficiency or the use of the information produced. The wisdom of continuing to enhance this 12-year-old system is questionable.

## ASSIGNMENT OF STAFF IS LARGELY INDEPENDENT OF WORK ASSESSMENT

Ideally, the software analysts and programmers are assigned to one of two staffs. The development staff, with accountable management, would be devoted to discretionary work, such as development, redesign, and conversion. Once an application or system is developed, a skeletal staff--preferably from the original design team--would be established to provide maintenance. The balance of the team would return to a development pool to await reassignment. When a decision is made to redesign the system, a new team would be assembled, preferably consisting of members from the maintenance staff along with knowledgeable staff from the development pool.

VA does not follow this approach to software development. With one exception, it assigns its staff to users to "maintain" specific software systems. In some cases the maintenance staff is larger than the staff initially used to develop the systems. Beyond the work required to sustain operations, additional work is initiated and approved to keep the staff busy. This additional discretionary work can be the major workload, contrary to the implication that the work is required maintenance.

The Veterans Administration has 414 analysts and programmers at its six data processing centers. One hundred are assigned to work for the office of data management and telecommunications on the Target system; the other 314 are more or less permanently assigned to "maintain" designated software at the center where they are located. The office of data management and telecommunications operates the six data processing centers, but users such as the department of veterans benefits have much of the responsibility for maintaining the software and supervising the software staff. The users are authorized to approve application changes costing up to $350,000.

VA policy allows the office of data management and telecommunications to shift staff among the various user systems to handle workload balances. In practice, however, this is seldom done.

## The method of assigning staff should be changed

VA's practice of dedicating large staffs to maintain specific applications is not a good one and should be changed. The practice does not recognize the reality that established systems normally require little maintenance and that what the present "maintenance" staff is really doing is enhancement work. Such work is optional and its need should be considered in relation to other discretionary work. The present practice tends to bias decisions about priorities and makes it difficult to determine how many ADP analysts and programmers are actually needed for required work and how many are available for discretionary work. It also promotes parochial rather than comprehensive assessment and approval of software work and tends to encourage work initiation simply to keep the staff busy. The need to provide work for these dedicated maintenance staffs may provide the impetus for undertaking certain efforts. This is illustrated by the following examples.

In reviewing the LOGI system, we concluded that it was constantly being maintained and enhanced to provide work for the 14 people assigned to it. Similarly, it appeared that the St. Paul center undertook the Automated Pharmacy Information System conversion (estimated at $40,000) to keep assigned staff employed. As mentioned previously, the Automated Management Information System is being continually enhanced by the 27 people assigned to maintain it.

Although such efforts may be productive, they are initiated without considering other agencywide and departmentwide ADP needs. For example, the department of memorial affairs has several projects that appear to merit consideration; however, it has no staff to undertake them.

## CONCLUSIONS

The Administrator's policies for planning and approving software work seem reasonably sound, except that users are not asked to differentiate between required and discretionary work. Were such differentiation required and all policies enforced, we believe the policies would go far toward assuring that important and essential work gets done.

We do not believe, however, that the problem can be fully solved as long as staff are dedicated to maintaining specific systems. We believe that VA needs to establish a pool of staff dedicated to performing discretionary software work. The Air Force, as one example, has done this with considerable success.

## RECOMMENDATIONS

We recommend that the Administrator of Veterans Affairs:

--Amend his ADP policy to require users to distinguish between required and discretionary work in assessing, planning, and approving software work.

--Enforce his ADP planning and approval procedures.

--Establish a staff of ADP analysts and programmers to work on discretionary projects and assign skeleton crews to provide systems maintenance.

## CHAPTER 4

## SOFTWARE WORK IN PROCESS IS NOT WELL CONTROLLED

VA does not have a well-defined approach to managing approved software work. Instead, it follows an unstructured, often hurried approach. As a consequence its development projects have been plagued by cost overruns, schedule slippages, and reduced performance. The agency should devote more attention and effort to managing and controlling approved software projects.

### KEY SOFTWARE OBJECTIVE: TO MEET USER REQUIREMENTS AND STAY WITHIN COST AND TIME TARGETS

As with any manufacturing and construction process, the key objective in developing software is to meet user requirements and complete the work within cost and time targets. Software development is not easy. It is a complicated, time-consuming process requiring the collaboration of top management, users, and technical ADP staff. It includes the preparation of specifications to satisfy user operating requirements, writing the code (programming), and testing the completed programs. Work must be carefully structured and managed to assure success.

Failure is not uncommon. In numerous reports we have documented the failure of other Federal agencies in software development. These failures have resulted in hundreds of millions of dollars being spent for software that was not cost effective, did not meet user needs, caused prolonged construction and cost overruns, and simply did not work.

### SOFTWARE PROJECTS PLAGUED BY COST AND SCHEDULE OVERRUNS AND FAILURE TO MEET DESIGN OBJECTIVES

We examined work done on software development projects at Austin, Hines, and St. Paul. We found cases where work on projects had to be redone, where follow-on work has been required to successfully complete projects, and where work has continued even though the primary specification objective was abandoned. Moreover, for many projects done by in-house staff, learning how much is spent or whether schedules are met is difficult because no cost and schedule targets are set and no composite record is kept of costs incurred.

These conditions are attributable to two major problems. First, VA has done a poor job of preparing work specifications and has complicated this by starting work before explicitly setting forth what is to be done. Secondly, responsible managers were not monitoring costs and progress during development.

Work specifications are faulty

Poorly prepared work specifications are contributing to late, costly, and possibly faulty software development. The problem is two-fold--the tasks are not being adequately planned and the specifications furnished by the users to analysts and programmers do not effectively communicate the user requirements.

In our review of selected major projects, we noted that the specifications the programming staff received were often so poorly written that the staff could not understand them. Clarification often resulted in amended specifications which again had to be clarified. As a consequence, projects were delayed and valuable resources wasted. Project managers said (for large projects) they spend much of their time trying to understand the specifications.

Although specification problems affected many of the software projects we reviewed, they are best illustrated by a department of veterans benefits project to make legislative changes to the Compensation, Pension, and Education system. Specifications given to the analysts and programmers by veterans benefits officials are being constantly changed and occasionally prescribe erroneous requirements. For example, one task was amended 11 times, which included reversing much of the original task, adding requirements, changing the logic, correcting requirements, and canceling the eighth change. Personnel at the center could not estimate the time lost for these changes; however, at least 1,013 of the 3,750 programmer hours expended on the project resulted from errors in user specifications.

VA systems auditors who certify the programming work describe the specifications as loose, inconclusive, and sometimes incorrect. When the specifications are so weak, the auditor's certification that the programming is meeting those specifications provides little assurance that the system will function as the user desires.

We could not estimate the time lost and the cost added to projects resulting from faulty specifications. Developing such an estimate would have required tracking back over every

step of development and programmers' use of the specifications. The task would have been too time consuming to be accomplished during our review.

Formal process needed for preparing and transmitting specifications

Faulty specifications indicate two serious problems: (1) an inadequate understanding of the functional tasks to be accomplished and (2) a need to improve the methods by which task objectives are identified and developed.

Our experience has shown that a certain degree of formality is required when translating user functional needs into technical specifications. At a minimum, analysts/designers and the users who state the requirements should have to write their understandings and agreements in a standardized format that identifies clearly what is to be done and what is to be produced. For example, it would be reasonable to require sample copies of the expected output report as seen by the individual stating the requirement.

Formalized methods of communicating also provide audit trails that show accountability and can reveal weak spots in the process. VA does have such a procedure but the procedure needs to be reexamined and corrected to eliminate the types of problems we discussed above.

No formal system used to monitor work in process

VA employs rudimentary procedures for tracking progress on development efforts; however, these procedures do not provide the type of information required to effectively manage development projects. They are designed primarily to assist local management in monitoring the progress of work. Staff hours spent at field installations are reported, but information comparing actual performance to schedule or budget targets is not. Also, data is reported by subtask, which may or may not bear an identifier to link it to its parent project. Furthermore, information is not provided on the impact of schedule slippages or on the ability of completed programs to perform their design functions.

Recognizing the need for a system to monitor the Target development effort, VA decided to use a full-fledged project scheduling and tracking system. This system, called the Management Schedule and Control System is based on the critical path analysis of subtasks to be performed. It provides for scheduling the tasks, setting milestones, and reporting actual performance and costs against the milestones. Use of this system was short lived, however. Management felt it was too

cumbersome to maintain and is seeking a replacement. In the interim, the project is proceeding without a formal monitoring mechanism.

## Need for good management control system recognized

As early as 1977, the Administrator recognized the need for a life-cycle approach to ADP systems management. VA is presently establishing such an approach, which will divide the activities of an ADP effort into distinct phases from initiation to termination. Formal management control points are placed between and within each phase. The approach has not yet received unanimous support; however, it is in the final stages of coordination.

## CONCLUSION

We have learned from our experience that success in developing software depends on having a well-organized, structured approach to doing the work and tight management control to see that it is done right. VA recognizes that it needs to devote more attention and effort to managing approved software work. We believe the management control techniques VA is proposing should, if faithfully followed, lead to better software development efforts. However, VA needs to reexamine its procedures for preparation, review, and approval of work specifications.

## RECOMMENDATIONS

We recommend that the Administrator of Veterans Affairs quickly

--adopt and act to enforce the management techniques being proposed for controlling software work and

--reexamine and correct the procedures for preparing specifications that are used to task the software programmers.

## CHAPTER 5

## HOSPITALS' USE OF DATA PROCESSING NOT ADEQUATELY COORDINATED

VA has not done a good job of managing its hospitals' use of data processing. Hospitals are allowed considerable latitude in choosing which medical functions to automate. This has led to the procurement and in-house development of different computer systems to automate similar medical functions. Also, opportunities for sharing these systems with other hospitals is not systematically pursued. Savings from using standardized systems and consolidated purchasing are foregone as are potential improvements in patient care and reductions in operating costs from sharing knowledge of successful systems. Hospital innovations in the use of computers can produce benefits, but VA needs to better coordinate hospital efforts to prevent duplication and reap the full benefits.

### SIMILARITY OF HOSPITAL FUNCTIONS INDICATES A NEED FOR COMMON ADP DESIGN AND CONSOLIDATED ACQUISITIONS

VA has 172 medical centers located throughout the United States, Puerto Rico, and the Philippines. Although some of these medical centers perform functions that others do not, the basic ADP requirements for each hospital should not differ so greatly that differences could not be accommodated by computer program modifications and supplements.

In such circumstances--where an organization has a large number of similar facilities--the situation seems tailormade for the design of uniform ADP systems for common functions and for the centralized procurement of equipment to take advantage of bulk prices. The Air Force, for example, has done this at its more than 100 air bases.

### COORDINATED APPROACH NOT FOLLOWED IN AUTOMATING MEDICAL FUNCTIONS

VA policies require that most computers be acquired centrally by the office of data management and telecommunications. However, acquisition of computers for specialized functions of hospitals is the responsibility of the department of medicine and surgery. This department provides central control for some systems, such as hospital supply needs, but allows hospitals considerable latitude in choosing the functions they will automate. Hospitals can purchase computer systems--software and equipment--to automate functions or

(with approval of the department of medicine and surgery) have systems developed by the department's ADP staff and operated at one of VA's six major data processing centers.

This approach to managing hospitals' use of computers has had predictably bad results. Hospitals have had VA staff develop different systems to automate similar medical functions. They have also bought specialized systems. Perhaps most importantly, opportunities for sharing successful applications among hospitals are not systematically pursued. 1/

Duplicate systems developed

We did not determine how many specialized, duplicative, or partially duplicative systems VA hospitals had purchased or had developed in-house. VA did not have these records. 2/ Nevertheless, available evidence indicates that the number is substantial.

The department of medicine and surgery runs 150 applications at VA's data processing centers. In a 1977 study for this department, a contractor identified 37 of these 150 applications that may be partially duplicated by other applications. He recommended that these 37 be reevaluated for possible improvement, including elimination of redundancy or duplication. He also recommended that 32 additional applications operated for just one user be reevaluated to determine if they could be shared by others or terminated. To our knowledge VA has not made these evaluations.

Duplicate systems procured

From our review we know that hospitals have purchased different systems to automate several similar functions. Hospitals have acquired at least 400 small- to medium-sized computers. Five of the eight hospitals we reviewed were using computers to automate a pharmacy, a clinical laboratory, patient scheduling, cardiopulmonary treatment, building air conditioning control, and basic medical research. One hospital was considering the automation of medical records. As best we could determine, with the exception of the clinical laboratories, these systems were acquired independently.

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1/ We were told that since the time of this review actions have been initiated to more effectively control the purchase and use of computers by the hospitals.

2/ VA was trying to make an accurate inventory of its equipment during our review.

The following two examples illustrate the savings foregone from acquiring different systems.

Duplicate Electrocardiograph Automated Systems

Houston's VA hospital has acquired a computer system which provides electrocardiograph support to itself and, through telecommunications, to 11 other hospitals. The hospital in San Antonio has a system which performs a similar function. The cost of the San Antonio unit, which uses a different computer, was about $162,000. The Administrator of the San Antonio hospital said that if he had been aware of the intricacies of computer equipment he would have purchased equipment compatible with Houston's so they could share computer programs.

We do not know how much the San Antonio hospital could have saved had it acquired equipment similar to Houston's and used Houston's computer programs, but we believe it would have been several thousand dollars. Also, if one or both of the systems improve patient care or reduce operating costs it would seem prudent to develop a standard automated system for other hospitals to use or share.

Duplicate pharmacy systems

Five VA hospitals have independently acquired some aspects of automated pharmacy systems. The most recent of these cost over $90,000. We believe that much of this could have been avoided if similar equipment had been purchased and one set of software developed instead of several systems.

Not all of the existing systems could have been readily shared, however. One hospital used computer programs written in a language unique to its IBM computer. This limited the program's use to hospitals having a similar IBM computer. In 1976, the hospital upgraded the system noncompetitively to a large IBM system. At the time of our review, still another upgrade had been requested.

Had the first successful pharmacy system been standardized as the single VA system, several hundred thousand dollars might have been saved. Again, this does not address the potential savings and improvements in patient care that other hospitals might realize by having automated pharmacy systems.

Sharing of successful systems
not systematically pursued

Obviously, automated systems that have proven successful should be shared with other hospitals to take full advantage of improvements in patient care and reductions in hospital operating costs. Indicating the untapped potential for sharing, the San Antonio hospital has at least eight automated systems while the New Orleans medical center has none.

VA should study its 150 medical applications operated at the data processing centers plus those operated by hospitals, to determine if the applications should be improved, shared, or terminated.

## SAVINGS FOREGONE TO DATE MAY BE SMALL BUT POTENTIAL EXISTS FOR SUBSTANTIAL FUTURE SAVINGS

Our evidence indicates that many, perhaps most, of the systems that hospitals have purchased and developed are relatively small and inexpensive. Thus, the savings foregone to date may not be overwhelming, although in composite we believe they are material. We did not try to estimate the savings. To do so at this time would be somewhat speculative since, for example, we do not know what prices might have been obtained if a consolidated purchase of some of the 400 computers had been made. Further, for each system we would need cost, price, and benefit data that was not readily available. More important than foregone savings, however, is the potential for truly substantial future savings and improvements in patient care, especially as VA moves to develop its standardized Health Care Information System.

## COORDINATED COMPUTER USE WOULD MINIMIZE DUPLICATION, REALIZE FULL BENEFITS

We find nothing wrong with permitting hospitals to experiment in using computers for differing functions. In fact, it can be a good way to foster and capitalize on individual ingenuity. But such efforts must be coordinated. It makes no sense to permit one VA hospital to independently acquire or develop a system that another VA hospital has already developed, is operating successfully, and could share. It makes even less sense for a hospital to attempt a system which another hospital has tried and found ineffective or inefficient.

VA's department of medicine and surgery recognizes the importance of coordinating computer use and has an office

to perform this function. For the most part, however, that office has not been effective. One reason is the lack of a clear definition of a computer. A system is referred to by its generic name, such as "pharmacy system," and is not generally called a computer. As a result, hospitals have acquired computer systems without the informing the department of medicine and surgery. Another reason is that the department has not had an adequate communications network to disseminate policy and related information pertinent to the management of ADP resources.

The department of medicine and surgery is now emphasizing control of the various automated projects being developed by the hospitals. A new manager has been appointed and given greater authority to achieve the needed centralized direction. Although it is too early to judge how successful this new effort will be, given the traditional autonomy of the VA hospitals and the absence of any formal process for accountable participation and coordination among the hospitals, we are pessimistic about this office's success.

## CONCLUSIONS

We recognize that important contributions can be made by local initiatives, and we believe that benefits can be achieved by having hospitals experiment in using computers for medical functions. However, it is also clear that VA could capitalize on many opportunities to save money by standardizing successful ADP systems for various hospital functions and consolidating equipment purchases to take advantage of bulk prices.

The department of medicine and surgery and the office of data management and telecommunications should jointly coordinate and control the use of data processing by hospitals. Coordination involves objectively analyzing the cost benefit of experimental systems, standardizing those systems found to be cost effective, and identifying hospitals that could benefit from using the standardized system. Whenever practical, equipment requirements should be consolidated for a bulk purchase to be made by the office of data management and telecommunications.

## RECOMMENDATIONS

We recommend that the Administrator of Veterans Affairs continue to encourage individual hospitals to automate unique hospital functions while establishing greater control by:

--Fully supporting the new effort by the department of medicine and surgery to coordinate and control the use of computers by hospitals.

--Making the office of data management and telecommunications responsible for all computer purchases and directing that equipment acquisitions be consolidated where practical to gain savings from bulk purchases.

--Directing the department of medicine and surgery to evaluate all existing computer applications used by hospitals to determine if they are cost effective, should be designed as a standard VA system for use by other hospitals, or be terminated.

## CHAPTER 6

## DEVELOPMENT OF A HEALTH CARE INFORMATION SYSTEM MAY BE PREMATURE

The Administrator has approved the mission need statement for a Health Care Information System estimated in 1978 to cost $520 million. While hospitals definitely need more computer support, VA should do considerable research before committing itself to a design for that system. Most, if not all, of the 13 functions proposed for automation may have already been automated by one or more of VA's hospitals or by private hospitals. VA should first determine whether any of these established systems will meet its needs. Use of existing systems could speed up installation and save millions of dollars.

The health care system must interface with some of VA's other major systems; the extent and nature of this interface should be a design consideration. Also, VA hospitals should be more involved in determining the specific requirements. Our experience has proven many times that when users do not participate in a responsible and accountable way, systems usually fail.

### APPROVAL GIVEN FOR HCIS

The Administrator has approved a mission need statement for the Health Care Information System. The proposed system will automate the following 13 functions within each VA hospital.

- Admissions
- Building management
- Clinical laboratories
- Dental
- Dietetics
- Discharges
- Neurology
- Nursing
- Pharmacy
- Radiology
- Supply
- Transfers
- Treatment scheduling

A nationwide network is planned to allow hospitals access to each other's data. The entire system was estimated in 1978 to cost $520 million.

## ACTIONS REQUIRED TO AVOID COMMON MISTAKES IN DESIGNING NEW SYSTEMS

Federal agencies have typically made two mistakes in putting in new systems. First, they have designed systems without the participation of users--those who will ultimately rely on the system. Our experience in reviewing such systems is that few are successful. Most go unused or fail to serve their purpose; they must be redesigned or discarded.

The second mistake agencies have made is developing their own unique system without investigating the availability of an existing similar system from either a commercial source or another Federal agency. First-time development of systems was often necessary in the 1960s, but today many functions have been automated. Hospital functions are no exception.

To avoid making similar mistakes VA must (1) formalize the involvement of users in the requirements definition, design, and development phases and (2) analyze the feasibility of using existing systems to support its needs.

## USER PARTICIPATION--A KEY TO DEVELOPING SUCCESSFUL SYSTEMS-- NOT BEING OBTAINED

Our experience has shown that those in the agency who will be expected to use the output of completed systems should participate in formulating the requirements. Involvement of users early in the planning of a project can help assure that existing applications are not duplicated and that interaction between applications are identified and considered in the design. But most important, user involvement gives management some assurance that the computer output will be effectively used.

VA currently lacks a mechanism for effectively involving the various hospitals in any centralized ADP project. Automation within the medical community has hinged more or less on the initiative of individual hospitals. The VA ADP planning process has no formal structure that assures effective user participation and a sense of responsibility for the formulation of specific requirements.

We understand that VA intends to rely heavily on outside contractors to identify requirements and design the system. However, the eventual users of the system--the hospitals--must participate fully in this process.

Contractors can assist in providing a wide range of technical support and they can identify duplicative applications and the need for interaction with other systems. They can also assist in identifying performance deficiencies and targets that should be set for new systems. If they are not encouraged to participate, however, users will be in no position to provide the background information needed for effective resolution of conflicting operational, economic, and technical viewpoints. More importantly, our experience shows that users often will not assume accountability for implementation of a system when they have been excluded from the decisions on the requirements for and the development of that system.

Potential overlap and interface problems exist

Without active participation of hospitals, it is difficult to identify the need for interface between existing hospital automated applications. We believe that the health care system must be interfaced with existing systems.

As noted in chapter 5, about 150 applications are already being processed for hospitals at the six data processing centers. The hospitals also have purchased at least 400 small computers and automated a number of functions, including some of the 13 listed earlier. All applications now being processed should be assessed for potential integration with the new system.

The experiment mentioned earlier, where Target terminals are being placed in some hospitals, underscores the need for considering the interdependencies of the proposed Health Care Information System and applications managed by the department of veterans benefits. Similarly, the current workload on the hospitals in providing input to the Automated Management Information System managed by the controller's office is another example of an existing system whose requirements should be examined as part of the proposed Hospital Care Information System.

The need to examine the interdependencies among the VA departments as part of the development of the proposed hospital information system is a critical one. While this coordination can be facilitated by contractors and committees, we are convinced that a formal planning structure and a fully understood planning process are essential. That process should include participation and responsible coordination among the major user departments as well as those within the department of medicine and surgery.

Obtaining participation of user hospitals may not be easy

Obtaining the participation of hospitals may not be easy. A representative group will have to be selected from 172 VA hospitals. Moreover, we found a serious lack of communication about ADP matters among the hospitals and the central office of the department of medicine and surgery. The hospital directors we spoke with are convinced that automation can help them improve patient care, but they are frustrated and puzzled about how to acquire this support and how to control it effectively. One recently appointed hospital director said he was appalled that a medical center as large as his had no effective ADP support. A senior official of the central office agreed that no effective system exists for disseminating policy and related information about ADP management in VA hospitals. The autonomy traditionally enjoyed by VA hospitals contributes to the communication and participation problems.

POTENTIAL FOR USING EXISTING SYSTEMS

It is possible that most if not all the 13 functions identified for automation as part of the health care system have been automated by one or more of VA's hospitals or by private hospitals. We know from our cursory research that 11 of the functions have been automated by either or both VA hospitals and outside organizations. Two operating systems in the public domain that have been developed with Federal financial support are COSTAR and PHAMIS. COSTAR was developed by the Laboratory for Computer Sciences at Massachusetts General Hospital. PHAMIS was developed by personnel of the Public Health Hospital in Seattle, Washington. Both provide core capability--registration/admission, discharge, transfer, and appointment scheduling--plus other options. Commercial systems that include some of VA's 13 functions also exist in the market place.

In addition to these systems, VA hospitals have developed several of their own. We know of 10 with names similar to the 13 functions planned for inclusion in the medical care system--pharmacy, radiology, dietetics, dentistry, supply, clinical laboratories, building air conditioning control, admissions, and patient scheduling. The Washington, D.C., VA hospital has an automated hospital information system that includes admissions and dispositions, dietetics, laboratory, and radiology. Some of these functions have been automated by more than one hospital. For example, 5 hospitals have pharmacy systems and 10 have clinical laboratory systems.

It is possible that these systems are not appropriate for use as part of VA's health care system, but they would

seem to be logical candidates for consideration. At a minimum, each should be examined to learn the good features to be adopted and the problems and weaknesses to be avoided. 1/

LESSON TO BE LEARNED FROM OTHERS

The potential consequences of failure to have a solid basis of user participation are illustrated by experiences reported in a Department of Defense project quite similar to VA's proposed health care information system. This project, known as the tri-service medical information system (TRIMIS) and under which essential medical services of military medical facilities will be automated, was severely criticized in a report by the Chairman of the House Government Operations Committee.

According to the report, TRIMIS should improve the quality of health care while reducing costs. However, the report strongly criticized both the lack of user involvement in and responsibility for the program and management's excessive dependence on a contractor to provide the necessary leadership. The report also criticized DOD's failure to consider existing systems. The report stated that the $70 million spent on TRIMIS since 1974 has essentially been wasted and if TRIMIS is to have any chance for success, the following three conditions should be met:

--The personnel within the facility must be involved early and intensively.

--Administrators, health care providers, and clerical personnel within a medical facility must be convinced that automation will benefit their job performance.

--The system to be installed must be reliable and easy to operate.

The experiences in the Department of Defense TRIMIS program can furnish valuable insights to VA officials in their effort to provide an automated health care information system for VA hospitals.

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1/ After completion of our audit work, VA officials said that their current acquisition strategy and the establishment of five user committees representing over 70 hospitals will address some of the problems we have raised in this chapter. However, we have not evaluated these actions.

## ACTIONS TAKEN BY VA

During the interval following the completion of our field work and issuance of this report, VA officials have provided us with additional information and/or advised us of actions they have taken on a number of the points discussed in our report. While we have not evaluated the impact of these items we have included them below.

1. We reported that VA's ADP Review Group has met only once since 1977. (See p. 16.)

   We were since told that the group had met informally. Also, on May 23, 1980, as this report was being finalized, we received a copy of a May 16, 1980, policy memorandum signed by the Administrator which, if carried out, should greatly strengthen the operation of the ADP Review Group and go a long way toward initiating some of the actions contained in our other recommendations.

2. We reported that approval authority for software work is not adhered to. (See p. 17 ror example.)

   We were told by several VA officials that since the time of our review their emphasis on observing approval protocol has increased and that a policy directive on that point is currently being coordinated within VA.

3. We reported that in 1978 the estimated cost of the HCIS was $520 million. (See p. 33.)

   We have been told that the estimate may be well below or well above that figure depending on the results of analyses and demonstration tests currently planned.

4. We reported that VA lacks a mechanism for effectively involving the various hospitals in any centralized ADP project. (See p. 34.)

   We were told that a users group representing 70 different hospitals has been established. Further, five separate committees, each concerned with a specific area of hospital automation, has been organized within this group.

5. We reported that the VA intends to rely heavily on outside contractors to identify and formulate requirements and design the HCIS. (See p. 34.)

We were told that VA is working with the office of Federal procurement and policy within the Office of Management and Budget to develop an acquisition strategy.

6. We suggested that existing VA systems be examined to assess whether they could be candidates for part of the HCIS. (See p. 36.)

   We were told that one such pharmacy system with the acronym APPLES was being considered as a basic standard for over 100 VA pharmacies.

7. We suggested that VA officials, in their efforts to provide automated health care systems, could obtain valuable insights from the experiences of the Department of Defense and its TRIMIS program. (See p. 37.)

   We were told that VA officials have made arrangements to work with the Department of Defense TRIMIS officials.

## CONCLUSIONS

We believe that a substantial portion of the $520 million VA has estimated it will spend for the Health Care Information System can be saved if VA makes a concerted effort to use existing systems--either those used by its own hospitals or those used by other organizations.

To aid in this process VA needs an effective mechanism for involving the hospitals in formulating requirements, overseeing development, and sharing accountability for results. The recently formed users group is a step in the right direction but followup will be needed to see if the group is effective. Also needed is a coordinating process that will detect duplication and interdependencies and enhance understanding and planning for the impact of agencywide systems among the VA departments. We believe that for large computerized systems, user participation, user accountability, and intradepartmental coordination are of such importance that they should be established as part of VA policy. For that reason we also believe that the Congress should withhold further funding of the proposed Health Care Information System until such procedures have been formally established as VA policy.

## RECOMMENDATIONS TO THE ADMINISTRATOR

We recommend that the Administrator of Veterans Affairs establish, as VA policy, a formal structure and process which at a minimum:

--Requires participation by users in the development of plans for ADP systems they will be expected to use.

--Assigns to officials whose organizational units are expected to use ADP systems a share of the accountability for formulating the system's requirements and for improving performance based on the use of completed systems.

We also recommend that the Administrator:

--Monitor the effectiveness of the recently formed users group for the Hospital Care Information System project to determine the degree of the group's involvement and the extent of its accountability for results.

--Require that the interdependencies among the existing and proposed ADP applications in other VA departments and those of the department of medicine and surgery be identified and coordinated.

--Require the ADP review committee to monitor the planning, development, coordination, and use of ADP resources agencywide and advise him of corrective actions needed.

## RECOMMENDATION TO THE CONGRESS

We recommend that the Congress withhold further funding for the Health Care Information System until it has been satisfactorily assured that VA will implement the substance of the recommendations contained in this report.

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